RP02

DISK PACK FORMATTER

MD-11-DZRPH-A

EP-DZRPH-A-DL-A

OCT 1976

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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZRPH-A-D
PRODUCT NAME:	RP11 DISK PACK FORMATTER
DATE CREATED:	DECEMBER 1, 1972
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	JOE STUBBLEBINE

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MAYNARD, MASS.

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1.0 ABSTRACT

THE RP11 FORMATTER CONSISTS OF THREE PARTS. PART 1 FORMATS AN RP02 DISK IN THE NORMAL MANNER AND CHECKS ALL ADDRESSES FOR VALIDITY. PART 2 ALLOWS THE OPERATOR TO REWRITE THE HEADER OF ANY DESIRED SECTOR. PART 3 FORMATS AND VERIFIES THE DISK WITH THE SEQUENCE OF SECTOR ADDRESSES SPECIFIED BY THE OPERATOR.

2.0 REQUIREMENTS

2.1 EQUIPMENT

STANDARD PDP-11 CONFIGURATION
RP11 DISK CONTROLLER
ONE OR MORE RP02 DISK DRIVES

2.2 STORAGE

PROGRAM REQUIRES 4K OF STORAGE

2.3 PRELIMINARY PROGRAMS

DZRPE DISKLESS DIAGNOSTIC
DZRPF RP11 RELIABILITY DIAGNOSTIC

3.0 LOADING PROCEDURE

USE STANDARD PROCEDURE FOR ABS TYPES.

4.0 STARTING PROCEDURE

4.1 CONTROL SWITCH SETTING

SEE SECTION 5.1.1

4.2 STARTING ADDRESS

THE PROGRAM MAY BE STARTED AT ONE OF FOUR LOCATIONS

1. STARTING ADDRESS 600 WILL FORMAT THE ENTIRE PACK AND THEN VERIFY THAT THE HEADERS HAVE BEEN WRITTEN CORRECTLY.

2. STARTING ADDRESS 2000 WILL ALLOW THE OPERATOR TO SPECIFY A PARTICULAR HEADER TO BE REWRITTEN AND VERIFIED

3. STARTING ADDRESS 3000 WILL FORMAT THE ENTIRE PACK USING THE SECTOR ADDRESS SEQUENCE PROVIDED BY THE OPERATOR. AFTER FORMATTING THE PACK IS VERIFIED.

4.3 PROGRAM AND/OR OPERATOR ACTION

1. LOAD THE PROGRAM INTO MEMORY USING THE ABS LOADER.

2. LOAD DESIRED STARTING ADDRESS

3. SET SWITCHES (SEE SEC 5.1.1)

4. PRESS START

5. WHEN THE PROGRAM IS COMPLETE, IT WILL RECYCLE.

5.0 OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

AFTER LOADING STARTING ADDRESS SELECT THE DESIRED SWITCHES.

F01

5.1.1 SWITCH SETTINGS ARE:

SW(15)=1.....DELETE ERROR HALT
SW(14) .....DELETE PRINTOUTS

5.2 SUBROUTINE ABSTRACTS

5.2.1 TRAPCATCHER

A ".+2" - "HALT" SEQUENCE IS REPEATED FROM 0-776 TO CATCH ANY UNEXPECTED TRAPS. THUS ANY UNEXPECTED TRAPS OR INTERRUPTS WILL HALT AT THE VECTOR +2.

5.2.2 ERROR HANDLER

THIS ROUTINE IS ENTERED UPON DETECTION OF AN ERROR. THE ERROR ADDRESS, PDP-11 STATUS, AND RELEVENT ERROR INFORMATION IS TYPED OUT. INHIBIT TYPEOUTS, AND HALT ON ERROR SWITCHES ARE TESTED.

6.0 ERRORS

6.1 ERROR PRINTOUTS

#1 ERROR MESSAGE FORMAT:

ERROR AT ADDRESS XXXX PS= PROCESSOR STATUS
CALLED FROM SUBROUTINE AT YYY
RPCS = CONTENTS OF RPCS
RPCS = CONTENTS OF RPCS
RPER = CONTENTS OF RPER
RPDS = CONTENTS OF RPDS

XXXX = THE ADDRESS WHERE THE ERROR WAS ENCOUNTERED.
YYY = IF THE ERROR WAS ENCOUNTERED IN A SUBROUTINE, THIS ADDRESS REFERS BACK TO THE MAINLINE CODE WHICH CALLED THE SUBROUTINE.

#2 ERROR AT ADDRESS XXXX PS= PROCESSOR STATUS
CALLED FROM SUBROUTINE AT YYY

```
                        CYLINDER  TRACK   SECTOR
              GOOD =       -        -       -
              BAD  =       -        -       -
```

THIS MESSAGE IS GIVEN IF AN ERROR OCCURS WHILE VERIFYING A HEADER. GOOD EQUALS THE EXPECTED CONTENTS OF THE HEADER AND BAD EQUALS WHAT WAS ACTUALLY FOUND IN THE HEADER.

7.0 RESTRICTIONS

NONE

8.0 MISCELLANEOUS

8.1 EXECUTION TIME

AFTER PERFORMING THE SELECTED TASK, THE PROGRAM WILL RECYCLE..

8.2 STACK POINTER

THE STACK IS INITIALLY SET TO 600.

9.0 PROGRAM DISCRIPTION

9.1 STANDARD FORMATTER

ONCE STARTED THE PROGRAM TYPES:

UNIT

AND WAITS FOR INPUT. RESPOND WITH THE RELEVENT OCTAL NUMBER (0-7) AND TERMINATE WITH A CARRIAGE RETURN.

THE TTY THEN PRINTS:

SET THE FORMAT ENABLE SWITCH.

```
   289                                  SET THE RP11C WRITE ENABLE SWITCH.
   290                                  SET THE SELECTED UNIT WRITE ENABLE SWITCH.
```

STRIKE ANY TELETYPE KEY WHEN READY.

STRIKING ANY KEY CAUSES THE FORMATTING OPERATION TO BEGIN. WHEN THE DISK HAS BEEN FORMATTED, THE TTY PRINTS:

RESET THE FORMAT ENABLE SWITCH TO NORMAL.
STRIKE ANY TELETYPE KEY WHEN READY.

STRIKING ANY KEY CAUSE THE PROGRAM TO ENTER A READ/COMPARE HEADER SEQUENCE. WHEN COMPLETE THE PROGRAM WILL RECYCLE.

9.2 SINGLE HEADER FORMATTER

ONCE STARTED, THE PROGRAM QUERIES FOR THE UNIT NUMBER AS IN 9.1. THE PROGRAM THEN PRINTS:

CYLINDER TRACK SECTOR
OLD:

AND WAITS FOR INPUT.
TYPE THE PHYSICAL CYLINDER, TRACK, AND SECTOR OF THE DESIRED ADDRESS. TERMINATE THE FIRST TWO WITH A SPACE AND THE LAST WITH A CARRIAGE RETURN.
THE PROGRAM THEN TYPES:

NEW

AND WAITS FOR INPUT. THE THE DESIRED ADDRESS IN THE SAME SEQUENCE AS ABOVE. THE PROGRAM WILL FIRST REWRITE AND THEN READ THE DESIRED HEADER TO DETERMINE VALIDITY. WHEN FINISHED THE PROGRAM WILL RECYCLE.

9.3 SPECIAL FORMATTER

ONCE STARTED, THE PROGRAM QUERIES FOR THE UNIT NUMBER AS IN 9.1. THE PROGRAM THEN PRINTS:

INPUT THE SECTOR NUMBERS (0-9) IN THE DESIRED ORDER.

0:

RESPOND WITH THE FIRST DESIRED SECTOR NUMBER. THE OTHER NINE NUMBERS ARE REQUESTED AND SPECIFIED IN LIKE MANNER. ONCE A SECTOR NUMBER HAS BEEN USED IT

```
   347                                  CANNOT BE SPECIFIED AGAIN.
```

AFTER THE LAST PARAMETER HAS BEEN PROCESSED, THE PROGRAM WRITE THE PACK TO THE DESIRED FORMAT AND THEN ENTERS A READ/COMPARE HEADER SEQUENCE TO ENSURE THE VALIDITY OF ALL ADDRESSES. WHEN THE PROGRAM IS FINISHED IT WILL RECYCLE.

```
                                        %
                                        .ABS
                                        ;RP11 DISK FORMATTER
                                        ;COPYRIGHT 1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
                                        ;JANUARY 29,1971

                177570                  SR=177570               ;SWITCH REGISTER
                177776                  CC=177776               ;CONDITION CODES
                177560                  TKS=177560
                177562                  TKB=177562
                177564                  TPS=177564
                177566                  TPB=177566
                000060                  TKV=60
                000064                  TPV=64

                000015                  CR=15
                000012                  LF=12
                000006                  SP=%6                   ;STACK POINTER
                000000                  R0=%0
                000001                  R1=%1
                000002                  R2=%2
                000003                  R3=%3
                000004                  R4=%4
                000005                  R5=%5
                000006                  R6=%6
                000007                  R7=%7
                000007                  PC=%7
                000000                  XX=HALT
                177776                  PS=CC
                000240                  NOP=240
                000000                  P0=0
                000040                  P1=40
                000100                  P2=100
                000140                  P3=140
                000200                  P4=200
                000240                  P5=240
                000300                  P6=300
                000340                  P7=340
                000001                  B0=1
                000002                  B1=2
                000004                  B2=4
                000010                  B3=10
                000020                  B4=20
                000040                  B5=40
                000100                  B6=100
                000200                  B7=200
                000400                  B8=400
                001000                  B9=1000
                002000                  B10=2000
                004000                  B11=4000
                010000                  B12=10000
                020000                  B13=20000
                040000                  B14=40000
                100000                  B15=100000
                104000                  ERR=EMT
                104400                  ERM=TRAP
```

```
000001                  GB=B0
000002                  DD=B1
000004                  DS=B2
000010                  ER=B3
000020                  CS=B4
000040                  DA=B5
000100                  HD=B6
005726                  POP=5726
022626                  POPPOP=22626

                        .MACR   ANDI    A,B
                        BIC     #-A-1,B ;MASK A APPLIED TO B
                        .ENDM

                        .MACR   AND     A,B
                        COM     B               ;C(B) =MASK. INVERT IT
                        BIC     B,A     ;AND A WITH B
                        COM     B               ;RESTORE B
                        .ENDM

                        .MACR   ROTR    A
                        JSR     PC,RTR          ;ROTATE R0 A PLACES RIGHT
                        .WORD   A
                        .ENDM

                        .MACR   ROTL    A
                        JSR     PC,RTL          ;ROTATE R0 A PLACES LEFT
                        .WORD   A
                        .ENDM

                        .MACR   LOOP    A,B
                        JSR     PC,@#LERCHK     ;LOOP TO A ON ERROR IF SR13=1
                        JMP     A
                B:      JSR     PC,@#LUPCHK     ;LOOP TO A UNCONDITIONALLY IF SR12=1
                        JMP     A
                        .ENDM

                        .MACR   PNTM A
                        MOV     #A,R0           ;PRINT MESSAGE
                        JSR     PC,TYPOUT       ;POINTED TO BY A
                        .ENDM

                        .MACR   PNTOL A
                        MOV     A,R0            ;PRINT 6 OCTAL
                        JSR     PC,PNTOCT       ;NUMBERS IN A
                        .ENDM

                        .MACR   PNTO A
                        MOV     A,R0            ;PRINT OCTAL
                        JSR     PC,OCTPNT       ;NUMBER IN A WITHOUT LEADING 0'S
                        .ENDM

                        .MACR   PNTD A
                        MOV     A,R0            ;PRINT DECIMAL NUMBER
                        JSR     PC,DECPNT       ;IN A WITHOUT LEADING 0'S
                        .ENDM
```

```
                                                .=0
                    000000                      .REPT   140
                                                .+2                     ;TRAPPED OR INTERRUPTED TO PREVIOUS ADDRESS
                                                HALT
                                                .ENDR

                    000030                      .=30
000030  005532                                  .WORD   ERROR
000032  000340                                  .WORD   340
000034  005532                                  .WORD   ERROR
000036  000340                                  .WORD   340
```

```
                                                                
                                                                
                        000600                          .=600
                                                                
000600  012706  000600          START1: MOV     #START1,SP      ;INITIALIZE STACK POINTER
000604  012767  000340  177164          MOV     #P7,CC          ;LOCKOUT OTHER DEVICES
000612  000005                        RESET                   ;CLEAR THE WORLD
000614  004767  003202          IL1:    JSR     PC,UNIQ         ;GET UNIT#
000620                          URDY1:  PNTM    SWMES
000630  004767  004006                  JSR     PC,RIN          ;WAIT FOR KEYBOARD RESPONSE
                                                                
```

```
 496
 497  000634  004767  003362          NS2:    JSR     PC,HOME         ;HOME SEEK
 498  000640  012777  000732  006650          MOV     #RPI,@RPIV      ;RP11 PI VECTO
 499  000646  012777  000340  006644          MOV     #P7,@RPSV       ;RP11 PI STATUS
 500  000654  012777  000001  006570          MOV     #1,@RPWC        ;ALLOW DSH BREAKS
 501  000662  062777  014103  006556          ADD     #14103,@RPCS    ;WRITE 10/15 HEADER (FORMAT) WITH PI ON
 502  000670  112767  000200  177100          MOVB    #P4,PS          ;LOWER CPU PRIORITY
 503  000676  017704  006560          IL2:    MOV     @RPDA,R4        ;SAVE ADDRESS
 504  000702  012767  013560  006452          MOV     #6000.,TOG1     ;SETUP TIMEOUT
 505  000710  020477  006546          IL3:    CMP     R4,@RPDA        ;HAS ADDRESS CHANGED?
 506  000714  001370                          BNE     IL2             ;YES - RECYCLE
 507  000716  005367  006440                  DEC     TOG1            ;NO - HAS 100 MSEC. TIMED OUT?
 508  000722  001372                          BNE     IL3             ;NO - KEEP CHECKING
 509  000724  104074                          ERR+DS+CS+ER+DA         ;DISK ADDRESS NOT CHANGING IN TIME
 510  000726  000167  177702                  JMP     NS2             ;TRY AGAIN
 511  000732  004567  006150          RPI:    JSR     R5,SAVOS        ;RP11 PI HANDLER - SAVE R0-5
 512  000736  032777  100000  006502          BIT     #B15,@RPCS      ;ERROR?
 513  000744  001407                          BEQ     PIOK1           ;NO
 514  000746  104034                          ERR+ER+CS+DS            ;ERROR DURING FORMAT GENERATION
 515  000750  004567  006146          RPIX:   JSR     R5,RESTOS       ;RESTORE R0-5
 516  000754  005726                          POP                     ;POP OLD PC
 517  000756  012746  000634                  MOV     #NS2,-(SP)      ;PUSH A NEW PC
 518  000762  000002                          RTI                     ;EXIT
 519  000764  032777  000200  006454  PIOK1: BIT     #B7,@RPCS       ;DONE?
 520  000772  001002                          BNE     .+6             ;YES
 521  000774  104050                          ERR+CS+ER+CS            ;EXTRANEOUS PI DURING FORMAT PASS
 522  000776  000764                          BR      RPIX            ;TRY AGAIN
 523  001000  004567  006116                  JSR     R5,RESTOS       ;RESTORE R0-5
 524  001004  005726                          POP                     ;POP OLD PC
 525  001006  012746  001200                  MOV     #START2,-(SP)   ;PUSH A NEW PC
 526  001012  000002                          RTI                     ;EXIT TO PASS 2
```

```
                001200                                  .=1200
                
001200  012767  000340  176570  START2: MOV     #P7,PS          ;LOCKOUT PI'S
001206                                  PNTM    NSWMES
001216  004767  003420                  JSR     PC,RIN          ;WAIT FOR OPERATOR
001222  012777  000001  006216  P2L1:   MOV     #1,@RPCS        ;RESET RP11
001230  116777  006142  006212          MOVB    UNIT,@RPCS1     ;LOAD UNIT #
001236  004767  002760                  JSR     PC,HOME         ;HOME SEEK
001242  005067  006134                  CLR     CYL             ;CYL=0
001246  016777  006130  006202  P2L2:   MOV     CYL,@RPCA       ;START AT
001254  005077  006202                  CLR     @RPDA           ;SAR & TAR = 0
001260  112777  000011  006160          MOVB    #11,@RPCS       ;SEEK
001266  036777  006106  006142          BIT     ATNB,@RPDS      ;WAIT FOR
001274  001774                          BEQ     .-6             ;ATTN.
001276  105077  006134                  CLRB    @RPDS           ;CLEAR ATTN
001302  032777  004000  006126          BIT     #B11,@RPDS      ;DONE?
001310  001402                          BEQ     .+6             ;YES
001312  104074                          ERR+ER+CS+DS+DA         ;NO- SEEK INCOMPLETE ON PASS2 SEEK
001314  000742                          BR      P2L1            ;TRY AGAIN
001316  012777  176650  006126          MOV     #-600.,@RPWC    ;READ ONE CYLINDER OF HEADERS INTO
001324  012777  007722  006122          MOV     #INBUF,@RPBA    ;BUFFER
001332  052777  014000  006106          BIS     #14000,@RPCS    ;10/15 HEADER MODE
001340  112777  000005  006100          MOVB    #5,@RPCS        ;READ HEADERS
001346  032777  100200  006072          BIT     #B15+B7,@RPCS   ;ERROR OR DONE
001354  001774                          BEQ     .-6             ;NOT YET
001356  100002                          BPL     P2N1            ;DONE
001360  104074                          ERR+ER+DS+CS+DA         ;ERROR ON READ HEADER OP.
001362  000731                          BR      P2L2            ;RECYCLE
```

```
                                                                
                                                                
001364  005067  006014          P2N1:   CLR     HED             ;START ADDRESS CHECKING
001370  005067  006012                  CLR     SEC             ;INITIALIZE GOOD DATA
001374  012704  007722                  MOV     #INBUF,R4       ;POINTER TO DATA READ
001400  004767  002742          P2L3:   JSR     PC,CHKAD        ;CHECK DATA
001404  000240                          NOP                     ;NO LOOPING
001406  005267  005774                  INC     SEC             ;ADVANCE SEC#
001412  026727  005770  000011          CMP     SEC,#9.         ;OVFLO?
001420  101002                          BHI     .+6             ;YES
001422  000167  177752                  JMP     P2L3            ;NO- CHECK NEXT ADDRESS
001426  005067  005754                  CLR     SEC
001432  005267  005746                  INC     HED             ;ADVANCE HEAD#
001436  026727  005742  000023          CMP     HED,#19.        ;OVFLO?
001444  101002                          BHI     .+6             ;YES
001446  000167  177726                  JMP     P2L3            ;NO- CHECK NEXT ADDRESS
001452  005067  005726                  CLR     HED
001456  005267  005720                  INC     CYL             ;ADVANCE CYL#
001462  026727  005714  000312          CMP     CYL,#202.       ;DONE ALL?
001470  101002                          BHI     START3          ;YES
001472  000167  177550                  JMP     P2L2            ;NO- READ ANOTHER BLOCK
                                                                
001476  000240          START3: NOP                             ;A HALT CAN GO HERE
001500  000167  177074                  JMP     START1          ;REPEAT
                                                                
```

```
                002000                          .=2000
002000  012706  000600          HSTRT:  MOV     #START1,SP      ;SET STACK POINTER
002004  012767  000340  175764          MOV     #P7,CC          ;LOCKOUT PI
002012  000005                          RESET                   ;CLEAR THE WORLD
002014  004767  002002                  JSR     PC,UNIQ         ;GET UNIT
002020                                  PNTM    HDMS
002030                          HL1:    PNTM    OLDMS
002040  012705  000312                  MOV     #202.,R5        ;HIGHEST CYLINDER
002044  004767  002100                  JSR     PC,PARIN        ;FETCH PARAMETER
002050  000767                          BR      HL1             ;ERROR RECYCLE
002052  016767  005316  005336          MOV     WORK1,CYLA      ;SAVE VALUE
002060  012705  000023                  MOV     #19.,R5         ;HIGHEST TRACK
002064  004767  002060                  JSR     PC,PARIN        ;FETCH PARAMETER
002070  000757                          BR      HL1             ;ERROR RECYCLE
002072  016767  005276  005320          MOV     WORK1,HEDA      ;SAVE VALUE
002100  004767  002416                  JSR     PC,TTIO         ;FETCH PARAMETER
002104  000751                          BR      HL1             ;ERROR RECYCLE
002106  020027  000011                  CMP     R0,#9.          ;HIGHEST SECTOR
002112  101346                          BHI     HL1             ;TOO BIG
002114  010067  005302                  MOV     R0,SECA         ;SAVE VALUE
002120                          HL2:    PNTM    NEWMS
002130  012705  000312                  MOV     #202.,R5        ;HIGHEST CYLINDER
002134  004767  002010                  JSR     PC,PARIN        ;FETCH PARAMETER
002140  000767                          BR      HL2             ;ERROR RECYCLE
002142  016767  005226  005232          MOV     WORK1,CYL       ;SAVE VALUE
002150  012705  000023                  MOV     #19.,R5         ;HIGHEST TRACK
002154  004767  001770                  JSR     PC,PARIN        ;FETCH PARAMETER
002160  000757                          BR      HL2             ;ERROR RECYCLE
002162  016767  005206  005214          MOV     WORK1,HED       ;SAVE VALUE
002170  004767  002326                  JSR     PC,TTIO         ;FETCH PARAMETER
002174  000751                          BR      HL2             ;ERROR RECYCLE
002176  020027  000011                  CMP     R0,#9.          ;HIGHEST SECTOR
002202  101346                          BHI     HL2             ;TOO BIG
002204  010067  005176                  MOV     R0,SEC          ;SAVE VALUE
```

```
620
621  002210  005067  005506          HGO:    CLR     INBUF                   ;HWRD1=0
622  002214  016767  005166  005504          MOV     SEC,INBUF+4             ;HWRD3=SECTOR
623  002222  116767  005156  005474          MOVB    HED,INBUF+2             ;LOAD
624  002230  006167  005470                  ROL     INBUF+2                 ;AND
625  002234  006167  005464                  ROL     INBUF+2                 ;JUGGLE
626  002240  006167  005460                  ROL     INBUF+2                 ;THE TRACK
627  002244  116767  005132  005453          MOVB    CYL,INBUF+3             ;AND CYLINDER
628  002252  006067  005446                  ROR     INBUF+2                 ;WORDS
629  002256  006067  005442                  ROR     INBUF+2                 ;INTO POSITION
630  002262  042767  140001  005434          BIC     #140001,INBUF+2         ;MASK OUT JUNK
631  002270  004767  001726          HGL1:   JSR     PC,HOME                 ;HOME SEEK
632  002274  012777  177775  005150          MOV     #-3,@RPWC               ;WORD COUNT
633  002302  012777  007722  005144          MOV     #INBUF,@RPBA            ;BUFFER ADDRESS
634  002310  052777  014000  005130          BIS     #14000,@RPCS            ;10/15 MODE HEADER OP
635  002316  016777  005074  005132          MOV     CYLA,@RPCA              ;LOAD CYLINDER
636  002324  116777  005070  005132          MOVB    HEDA,@RPDA1             ;TRACK,
637  002332  116777  005064  005122          MOVB    SECA,@RPDA              ;AND SECTOR TO BE CHANGED
638  002340  112777  000003  005100          MOVB    #3,@RPCS                ;REWRITE IT
639  002346  032777  100200  005072          BIT     #B!5+B7,@RPCS           ;ERROR OR DONE?
640  002354  001774                          BEQ     .-6                     ;NOT YET
641  002356  100002                          BPL     HGO1                    ;DONE
642  002360  104074                          ERR+ER+DS+CS+DA                 ;ERROR ON WRITE HEADER OP
643  002362  000742                          BR      HGL1                    ;TRY AGAIN
644  002364  005067  005332          HGO1:   CLR     INBUF                   ;DESTROY
645  002370  005067  005330                  CLR     INBUF+2                 ;OLD
646  002374  005067  005326                  CLR     INBUF+4                 ;DATA
647  002400  004767  001616          HGL2:   JSR     PC,HOME                 ;HOME SEEK
648  002404  012777  177775  005040          MOV     #-3,@RPWC               ;WORD COUNT
649  002412  012777  007722  005034          MOV     #INBUF,@RPBA            ;BUFFER
650  002420  016777  004772  005030          MOV     CYLA,@RPCA              ;DISK
651  002426  116777  004766  005030          MOVB    HEDA,@RPDA1             ;ADDRESS
652  002434  116777  004762  005020          MOVB    SECA,@RPDA              ;TO BE FOUND
653  002442  052777  014000  004776          BIS     #14000,@RPCS            ;10/15 MODE HEADER OP
654  002450  112777  000005  004770          MOVB    #5,@RPCS                ;READ
655  002456  032777  100200  004762          BIT     #B15+B7,@RPCS           ;ERROR OR DONE?
656  002464  001774                          BEQ     .-6                     ;NOT YET
657  002466  100002                          BPL     HGO2                    ;DONE
658  002470  104074                          ERR+ER+DS+CS+DA                 ;ERROR ON READING NEW HEADER
659  002472  000742                          BR      HGL2                    ;TRY AGAIN
660  002474  012704  007722          HGO2:   MOV     #INBUF,R4               ;R4=DATA POINTER
661  002500  004767  001642                  JSR     PC,CHKAD                ;CHECK REWRITTEN HEADER
662  002504  000735                          BR      HGL2                    ;ERROR - TRY AGAIN
663  002506  000240                          NOP                             ;A HALT CAN GO HERE
664  002510  000167  177264                  JMP     HSTRT                   ;REPEAT
665
666
```

```
                        003000                          .=3000

003000  012706  000600          SFSTRT: MOV     #START1,SP      ;SET STACK
003004  012767  000340  174764          MOV     #P7,CC          ;LOCKOUT PI
003012  000005                        RESET                   ;CLEAR
003014  004767  001002                JSR     PC,UNIQ         ;GET UNIT#
003020                        SFSL1:  PNTM    SECMES
003030  004767  000446                JSR     PC,CLRS         ;CLEAR FLAG STRING
003034  012767  177766  004320        MOV     #-10.,TOG1      ;DO BELOW 10 TIMES
003042  012705  003740                MOV     #NSTR,R5        ;POINTER TO MESSAGE POINTERS
003046  012704  003764                MOV     #SCSLT,R4
003052  012500                SFSL2:  MOV     (R5)+,R0        ;FETCH POINTER
003054  004767  004230                JSR     PC,TYPOUT       ;FOR MESSAGE
003060  004767  000436                JSR     PC,SIN          ;GET PARAMETER
003064  000755                        BR      SFSL1           ;ERROR
003066  005267  004270                INC     TOG1            ;DONE?
003072  001367                        BNE     SFSL2           ;NOT YET
003074  004767  000472        SFSL3:  JSR     PC,MKBUF        ;GENERATE A TABLE OF ADDRESSES
003100  116777  004272  004342        MOVB    UNIT,@RPCS1     ;RESET
003106  004767  001110                JSR     PC,HOME         ;SELECTED UNIT
003112  005067  004264                CLR     CYL             ;START AT CYL=0
003116  016777  004260  004332  SFSL4: MOV     CYL,@RPCA       ;LOAD
003124  005077  004332                CLR     @RPDA           ;DISK ADDRESS
003130  004767  000534                JSR     PC,SEKE         ;SEEK
003134  000757                        BR      SFSL3           ;ERROR RETURN
003136  012777  176650  004306        MOV     #-600.,@RPWC    ;GOOD RETURN
003144  012777  012222  004302        MOV     #OUTBUF,@RPBA   ;WC&CA
003152  052777  014000  004266        BIS     #14000,@RPCS    ;10/15 HEADER MODE
003160  112777  000003  004260        MOVB    #3,@RPCS        ;WRITE
003166  032777  100200  004252        BIT     #B15+B7,@RPCS   ;ERROR OR DONE
003174  001774                        BEQ     .-6             ;WAIT
003176  100002                        BPL     SFSN1           ;DONE
003200  104074                        ERR+ER+DS+CS+DA         ;ERROR ON WRITE HEADER OP
003202  000745                        BR      SFSL4           ;REPEAT
003204  012767  177470  004150  SFSN1: MOV     #-200.,TOG1
003212  012705  012224                MOV     #OUTBUF+2,R5
003216  062715  000100        SFSL5:  ADD     #100,(R5)       ;ADVANCE CYLINDER ADDRESS
003222  062705  000006                ADD     #6,R5           ;INDEX
003226  005267  004130                INC     TOG1            ;DONE?
003232  001371                        BNE     SFSL5           ;NO
003234  005267  004142                INC     CYL             ;ADVANCE CYLINDER
003240  026727  004136  000312        CMP     CYL,#202.       ;DONE?
003246  101001                        BHI     SFCHK           ;YES
003250  000722                        BR      SFSL4           ;NO
003252  012767  000340  174516  SFCHK: MOV     #P7,PS          ;LOCKOUT PI
003260  116777  004112  004162        MOVB    UNIT,@RPCS1     ;SET UNIT
003266  004767  000730                JSR     PC,HOME         ;HOME SEEK
003272  005067  004104                CLR     CYL             ;CYL=0
003276  016777  004100  004152  SFCL1: MOV     CYL,@RPCA       ;TAR=0
003304  005077  004152                CLR     @RPDA           ;SAR=0
003310  004767  000354                JSR     PC,SEKE         ;SEEK
003314  000756                        BR      SFCHK           ;ERROR RETURN
003316  012777  176650  004126        MOV     #-600.,@RPWC    ;WC
003324  012777  007722  004122        MOV     #INBUF,@RPBA    ;CA
```

```
 723
 724  003332  052777  014000  004106          BIS     #14000,@RPCS    ;10/15 HEADER OP
 725  003340  112777  000005  004100          MOVB    #5,@RPCS                :READ
 726  003346  032777  100200  004072          BIT     #B15+B7,@RPCS   ;ERROR OR DONE?
 727  003354  001774                          BEQ     .-6             ;NOT YET
 728  003356  100002                          BPL     SFCN1           ;JUMP IF DONE
 729  003360  104074                          ERR+ER+DS+CS+DA         ;READ HEADER ERROR
 730  003362  000745                          BR      SFCL1           ;LOOP
 731  003364  012705  003764          SFCN1:  MOV     #SCSLT,R5       ;SETUP SECTOR LIST AND
 732  003370  012767  177766  003764          MOV     #-10.,TOG1      ;COUNTER
 733  003376  005067  004002                  CLR     HED             ;SETUP GOOD DATA
 734  003402  012704  007722                  MOV     #INBUF,R4       ;SETUP BUFFER POINTER
 735  003406  012567  003774          SFCL2:  MOV     (R5)+,SEC       ;FETCH A SECTOR
 736  003412  004767  000730                  JSR     PC,CHKAD        ;CHECK ADDRESS
 737  003416  000240                          NOP                     ;NO LOOPING
 738  003420  005267  003736                  INC     TOG1            ;DONE ONE SURFACE?
 739  003424  001370                          BNE     SFCL2           ;NO
 740  003426  012705  003764                  MOV     #SCSLT,R5       ;YES - RESET
 741  003432  012767  177766  003722          MOV     #-10.,TOG1      ;SECTOR PARAMETERS
 742  003440  005267  003740                  INC     HED             ;ADVANCE TRACK
 743  003444  026727  003734  000023          CMP     HED,#19.        ;DONE?
 744  003452  101755                          BLOS    SFCL2           ;NO
 745  003454  005067  003724                  CLR     HED             ;YES - RESET HEAD
 746  003460  005267  003716                  INC     CYL             ;ADVANCE CYLINDER
 747  003464  026727  003712  000312          CMP     CYL,#202.       ;DONE?
 748  003472  101701                          BLOS    SFCL1           ;NOT YET
 749  003474  000240                          NOP                     ;A HALT CAN GO HERE
 750  003476  000167  177276                  JMP     SFSTRT          ;DO IT AGAIN
 751  003502  012705  177742          CLRS:   MOV     #-30.,R5        ;CLEAR
 752  003506  012704  003764                  MOV     #SCSLT,R4       ;THE SECTOR
 753  003512  105024                  CLRS1:  CLRB    (R4)+           ;SLOTS AND
 754  003514  005205                          INC     R5              ;FLAG POINTERS
 755  003516  001375                          BNE     CLRS1           ;EXIT
 756  003520  000207                          RTS     PC              ;WHEN DONE
 757  003522  004767  001114          SIN:    JSR     PC,RIN          ;ASSEMBLE
 758  003526  004767  003444                  JSR     PC,TTO          ;ECHO
 759  003532  162700  000260                  SUB     #260,R0         ;A LIST OF
 760  003536  020027  000011                  CMP     R0,#9.          ;LOGICAL SECTOR
 761  003542  101012                          BHI     SIN1            ;NUMBERS
 762  003544  005700                          TST     R0              ;TOO SMALL?
 763  003546  100410                          BMI     SIN1            ;0-9 ARE LEGAL
 764  003550  105760  004010                  TSTB    SCFLG(R0)       ;HAS THIS NUMBER BEEN USED?
 765  003554  001005                          BNE     SIN1            ;ERROR - THIS NUMBER ALREADY USED
 766  003556  105160  004010                  COMB    SCFLG(R0)       ;SET FLAG
 767  003562  010024                          MOV     R0,(R4)+        ;STORE SEC#
 768  003564  062716  000002                  ADD     #2,(SP)         ;ADVANCE RETURN
 769  003570  000207                  SIN1:   RTS     PC              ;AND EXIT
 770  003572  012767  177754  003562  MKBUF:  MOV     #-20.,TOG1      ;TOG1=COUNTER
 771  003600  012705  012222                  MOV     #OUTBUF,R5      ;R5=POINTER TO BUFFER
 772  003604  012704  003764                  MOV     #SCSLT,R4       ;R4=POINTER TO SECTOR LIST
 773  003610  012767  177766  003546          MOV     #-10.,TOG2      ;TOG2=SECTOR COUNT
 774  003616  005067  003550                  CLR     WORK
 775  003622  005025                  MKBL1:  CLR     (R5)+           ;WORD1=0
 776  003624  016725  003542                  MOV     WORK,(R5)+      ;WORK2=CYL+HEAD
 777  003630  012425                          MOV     (R4)+,(R5)+     ;WORD3=SECTOR
 778  003632  005267  003526                  INC     TOG2            ;DONE 10?
```

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   779  003636  001371                          BNE     MKBL1           ;NO
```

```
                                                        
003640  012704  003764                    MOV     #SCSLT,R4       ;YES - UPDATE POINTER,
003644  012767  177766  003512            MOV     #-10.,TOG2      ;COUNTER,
003652  062767  000002  003512            ADD     #2,WORK         ;AND TRACK
003660  005267  003476                    INC     TOG1            ;FINISHED?
003664  001356                            BNE     MKBL1           ;NO
003666  000207                            RTS     PC              ;EXIT
003670  105077  003542            SEKE:   CLRB    @RPDS           ;CLEAR ATTN
003674  112777  000011  003544            MOVB    #11,@RPCS       ;SEEK
003702  036777  003472  003526            BIT     ATNB,@RPDS      ;WAIT FOR
003710  001774                            BEQ     .-6             ;ATTN
003712  105077  003520                    CLRB    @RPDS
003716  032777  004000  003512            BIT     #B11,@RPDS      ;DONE?
003724  001402                            BEQ     .+6
003726  104474                            ERM+ER+CS+DS+DA         ;SEEK INCOMPLETE
003730  000207                            RTS     PC              ;ERROR EXIT
003732  062716  000002                    ADD     #2,(SP)         ;GOOD
003736  000207                            RTS     PC              ;EXIT
003740  004765                    NSTR:   N0
003742  004772                            N1
003744  004777                            N2
003746  005004                            N3
003750  005011                            N4
003752  005016                            N5
003754  005023                            N6
003756  005030                            N7
003760  005035                            N8
003762  005042                            N9
003764                            SCSLT:  .REPT   12
                                          .WORD   0
                                          .ENDR
                                          
004010                            SCFLG:  .REPT   12
                                          .BYTE   0
                                          .ENDR
                                          
                                          
```

```
817
818  004022                                  UNIQ:   PNTM    UMES
819  004032  004767  000464                          JSR     PC,TTIO         ;READ UNIT #
820  004036  000771                          BR      UNIQ            ;ERROR RECYCLE
821  004040  020027  000007                  CMP     R0,#7           ;TOO BIG
822  004044  101366                          BHI     UNIQ            ;YES
823  004046  010067  003324                  MOV     R0,UNIT         ;SAVE IT
824  004052  012700  000001                  MOV     #1,R0           ;DETERMINE ATTENTION BIT
825  004056  005767  003314                  TST     UNIT            ;NO  ROTATION
826  004062  001406                          BEQ     UNS1            ;IF 0
827  004064  016767  003306  000004          MOV     UNIT,DS1        ;NUMBER OF ROTATES
828  004072  004767  001406                  JSR     PC,RTL          ;TO DETERMINE ATTENTION BIT
929  004076  000001                  DS1:    .WORD   1               ;IS PUT HERE
830  004100  010067  003274          UNS1:   MOV     R0,ATNB         ;SAVE BIT
831  004104  116777  003266  003336          MOVB    UNIT,@RPCS1     ;SELECT UNIT
832  004112  032777  100000  003316          BIT     #B15,@RPDS      ;IS IT READY?
833  004120  001401                          BEQ     .+4             ;NO
834  004122  000207                          RTS     PC              ;YES - EXIT
835  004124  104434                          ERM+DS+ER+CS            ;SELECTED UNIT READY NOT UP
836  004126  000766                          BR      UNS1+4          ;LOOP UNTIL FIXED
837  004130                          SPACE:  PNTM    S1
838  004140  005367  003260                  DEC     TTG             ;PRINT NUMBER OF SPACES
839  004144  001371                          BNE     SPACE           ;IN TTG. THEN
840  004146  000207                          RTS     PC              ;EXIT
841  004150  004767  000346          PARIN:  JSR     PC,TTIO         ;READ SOME NUMBERS
842  004154  000401                          BR      .+4             ;THIS IS NOW THE GOOD RETURN
843  004156  000207                          RTS     PC              ;CR IS ILLEGAL FOR THIS SEQUENCE
844  004160  020027  000240                  CMP     R0,#240         ;IS IT A SPACE?
845  004164  001015                          BNE     PRX             ;NO - EXIT
846  004166  026705  003202                  CMP     WORK1,R5        ;TOO BIG?
847  004172  101012                          BHI     PRX             ;YES - EXIT
848  004174  005267  003224                  INC     TTG             ;TTG=# OF SPACES
849  004200  026727  003220  000005          CMP     TTG,#5          ;TOO MANY
850  004206  101004                          BHI     PRX             ;YES
851  004210  004767  177714                  JSR     PC,SPACE        ;JUSTIFY NEXT ENTRY
852  004214  062716  000002                  ADD     #2,(SP)         ;SKIP FOR GOOD RETURN
853  004220  000207                  PRX:    RTS     PC              ;EXIT
```

```
 854
 855  004222  105077  003210          HOME:   CLRB    @RPDS           ;CLEAR ATTN BITS
 856  004226  112777  000015  003212          MOVB    #15,@RPCS       ;HOME SEEK
 857  004234  012767  000005  003454          MOV     #5,DEBUG+174    ;WAIT FOR
 858  004242  005367  003450          WWW:    DEC     DEBUG+174       ;SEEK TO
 859  004246  001375                          BNE     WWW             ;START
 860  004250  032777  002000  003160          BIT     #B10,@RPDS      ;IS SEEK UNDERWAY?
 861  004256  001002                          BNE     .+6             ;YES
 862  004260  104434                          ERM+ER+DS+CS            ;SEEK NOT UNDERWAY
 863  004262  000757                          BR      HOME            ;FIX IT
 864  004264  036777  003110  003144          BIT     ATNB,@RPDS      ;WAIT FOR
 865  004272  001774                          BEQ     .-6             ;ATTENTION TO SET
 866  004274  032777  004000  003134          BIT     #B11,@RPDS      ;SEEK INCOMPLETE?
 867  004302  001402                          BEQ     .+6             ;NO
 868  004304  104434                          ERM+ER+DS+CS            ;DEVICE STATUS ERROR
 869  004306  000745                          BR      HOME            ;LOOP
 870  004310  132777  000023  003122          BITB    #23,@RPDS1      ;ANY ERRORS?
 871  004316  001402                          BEQ     .+6             ;NO
 872  004320  104434                          ERM+ER+CS+DS            ;DEVICE STATUS ERROR
 873  004322  000737                          BR      HOME            ;LOOP
 874  004324  112777  000001  003114          MOVB    #1,@RPCS        ;RESET THE RP11
 875  004332  105077  003100                  CLRB    @RPDS           ;CLEAR ATTN
 876  004336  116777  003034  003104          MOVB    UNIT,@RPCS1     ;RELOAD UNIT#
 877  004344  000207                          RTS     PC              ;EXIT
 878  004346  062704  000002          CHKAD:  ADD     #2,R4           ;SKIP 1ST WORD
 879  004352  012467  003034                  MOV     (R4)+,HEDR      ;FETCH HEAD AND
 880  004356  016767  003030  003024          MOV     HEDR,CYLR       ;CYLINDER READ
 881  004364  006067  003022                  ROR     HEDR            ;JUSTIFY HEAD
 882  004370  006167  003014                  ROL     CYLR            ;AND
 883  004374  006167  003010                  ROL     CYLR            ;CYLINDER
 884  004400  000367  003004                  SWAB    CYLR            ;FOR CHECKING
 885  004404  012467  003004                  MOV     (R4)+,SECR      ;FETCH SECTOR READ
 886  004410                                  ANDI    17,SECR
 887  004416                                  ANDI    37,HEDR
 888  004424                                  ANDI    377,CYLR
 889  004432  026767  002744  002750          CMP     CYL,CYLR        ;IS CYL# OK?
 890  004440  001013                          BNE     CMER            ;NO
 891  004442  026767  002736  002742          CMP     HED,HEDR        ;IS TRACK# OK
 892  004450  001007                          BNE     CMER            ;NO
 893  004452  026767  002730  002734          CMP     SEC,SECR        ;IS SECTOR# OK?
 894  004460  001003                          BNE     CMER            ;NO
 895  004462  062716  000002                  ADD     #2,(SP)         ;ALL ADDRESSES
 896  004466  000207                          RTS     PC              ;OK - EXIT
 897  004470  104500          CMER:   ERM+HD                          ;HEADER COMPARE ERROR
 898  004472  000207                  RTS     PC                      ;ERROR EXIT
 899  004474                  SUBER:  PNTM    SUBRMS
 900  004504  016600  000022          MOV     22(SP),R0       ;FETCH PC OF SUBROUTINE CALL
 901  004510  162700  000004          SUB     #4,R0           ;PC-4=ADDRESS OF SUBROUTINE CALL
 902  004514  004767  002426          JSR     PC,OCTPNT       ;PRINT ADDRESS
 903  004520  000207                  RTS     PC              ;EXIT
```

```
904
905  004522  012767  000005  002674  TTIO:   MOV     #5,TTG          ;INPUT UP TO 5 OCTAL DIGITS
906  004530  005067  002640          TTIL:   CLR     WORK1           ;CLEAR WORK REGISTER
907  004534  004767  000102                  JSR     PC,RIN          ;READ TTY CHARACTER INTO R0
908  004540  020027  000215                  CMP     R0,#215         ;IS IT CR?
909  004544  001427                          BEQ     TTIX            ;YES
910  004546  004767  002424                  JSR     PC,TTO          ;ECHO
911  004552  020027  000267                  CMP     R0,#267         ;TOO BIG?
912  004556  101030                          BHI     TTRX            ;YES
913  004560  020027  000257                  CMP     R0,#257         ;TOO SMALL?
914  004564  101425                          BLOS    TTRX            ;YES
915  004566  005367  002632                  DEC     TTG             ;COUNT DIGIT
916  004572  100422                          BMI     TTRX            ;TOO MANY?
917  004574                                  ANDI    7,R0            ;NO - MASK IT
918  004600  000241                          CLC                     ;AND
919  004602  006167  002566                  ROL     WORK1           ;SHIFT
920  004606  006167  002562                  ROL     WORK1           ;WORK REGISTER
921  004612  006167  002556                  ROL     WORK1           ;3 PLACES
922  004616  060067  002552                  ADD     R0,WORK1        ;ADD NEW NUMBER
923  004622  000744                          BR      TTIL            ;GET NEXT ONE
924  004624  004767  002346          TTIX:   JSR     PC,TTO
925  004630  062716  000002                  ADD     #2,(SP)         ;SKIP RETURN
926  004634  016700  002534                  MOV     WORK1,R0
927  004640  000207                  TTRX:   RTS     PC
928  004642  005267  172712          RIN:    INC     TKS             ;FETCH A CHARACTER
929  004646  105767  172706                  TSTB    TKS             ;WAIT
930  004652  100375                          BPL     .-4             ;FOR IT
931  004654  116700  172702                  MOVB    TKB,R0          ;READ IT INTO R0
932  004660                                  ANDI    377,R0
933  004664  000207                          RTS     PC              ;AND EXIT
934
935
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```
936
937  004666  023046  047125  052111  UMES:   .ASCII  /&&UNIT: @/
938  004674  020072     100
939  004677     046  044446  050116  SECMES: .ASCII  /&&INPUT THE SECTOR NUMBERS(0-9) IN THE ORDER DESIRED.@/
940  004704  052125  052040  042510
941  004712  051440  041505  047524
942  004720  020122  052516  041115
943  004726  051105  024123  026460
944  004734  024471  044440  020116
945  004742  044124  020105  051117
946  004750  042504  020122  042504
947  004756  044523  042522  027104
948  004764     100
949  004765     046  035060  040040  N0:     .ASCII  /&0: @/
950  004772  030446  020072     100  N1:     .ASCII  /&1: @/
951  004777     046  035062  040040  N2:     .ASCII  /&2: @/
952  005004  031446  020072     100  N3:     .ASCII  /&3: @/
953  005011     046  035064  040040  N4:     .ASCII  /&4: @/
954  005016  032446  020072     100  N5:     .ASCII  /&5: @/
955  005023     046  035066  040040  N6:     .ASCII  /&6: @/
956  005030  033446  020072     100  N7:     .ASCII  /&7: @/
957  005035     046  035070  040040  N8:     .ASCII  /&8: @/
958  005042  034446  020072     100  N9:     .ASCII  /&9: @/
959
960  005047     046  051446  052105  SWMES:  .ASCII  /&&SET THE FORMAT ENABLE SWITCH./
961  005054  052040  042510  043040
962  005062  051117  040515  020124
963  005070  047105  041101  042514
964  005076  051440  044527  041524
965  005104  027110
966  005106  051446  052105  052040          .ASCII  /&SET THE RP11 WRITE ENABLE SWITCH./
967  005114  042510  051040  030520
968  005122  020061  051127  052111
969  005130  020105  047105  041101
970  005136  042514  051440  044527
971  005144  041524  027110
972  005150  051446  052105  052040          .ASCII  /&SET THE SELECTED UNIT WRITE ENABLE SWITCH./
973  005156  042510  051440  046105
974  005164  041505  042524  020104
975  005172  047125  052111  053440
976  005200  044522  042524  042440
977  005206  040516  046102  020105
978  005214  053523  052111  044103
979  005222     056
980  005223     046  052123  044522          .ASCII  /&STRIKE ANY TELETYPE KEY WHEN READY.&@/
981  005230  042513  040440  054516
982  005236  052040  046105  052105
983  005244  050131  020105  042513
984  005252  020131  044127  047105
985  005260  051040  040505  054504
986  005266  023056     100
987
988  005271     046  051046  051505  NSWMES: .ASCII  /&&RESET THE FORMAT ENABLE SWITCH TO NORMAL./
989  005276  052105  052040  042510
990  005304  043040  051117  040515
991  005312  020124  047105  041101
```

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   992  005320  042514  051440  044527
   993  005326  041524  020110  047524
   994  005334  047040  051117  040515
   995  005342  027114
   996  005344  051446  051124  045511          .ASCII  /$STRIKE ANY TELETYPE KEY WHEN READY.$@/
   997  005352  020105  047101  020131
   998  005360  042524  042514  054524
   999  005366  042520  045440  054505
  1000  005374  053440  042510  020116
  1001  005402  042522  042101  027131
  1002  005410  040046
```

```
1003
1004                                            .EVEN
1005
1006  005412  032777  040000  002026  HRDER:  BIT     #B14,@RPCS      ;TEST HARD ERROR BIT
1007  005420  001001                          BNE     HRN1            ;OK IF SET
1008  005422  104020                          ERR+CS                  ;HARD ERROR NOT SET. C(SP) POINTS TO CAUSE
1009  005424  032777  100000  002014  HRN1:   BIT     #B15,@RPCS      ;TEST ERROR BIT IN RPCS
1010  005432  001401                          BEQ     .+4             ;OK IF SET
1011  005434  000207                          RTS     PC              ;OK- EXIT
1012  005436  104020                          ERR+CS                  ;RPCS ERROR NOT SET. C(SP) POINTS TO CAUSE
1013  005440  000207                          RTS     PC              ;EXIT
1014  005442  032777  040000  001776  SFTER:  BIT     #B14,@RPCS      ;TEST HARD ERROR BIT
1015  005450  001765                          BEQ     HRN1            ;OK IF CLEAR
1016  005452  104020                          ERR+CS                  ;SOFT ERROR SET HARD ERROR BIT
1017  005454  000763                          BR      HRN1            ;TEST INCLUSIVE ERROR
1018  005456  017667  000000  001746  RTR:    MOV     @(SP),ROTOG     ;FETCH SHIFT COUNT
1019  005464  062716  000002                  ADD     #2,(SP)         ;STEP RETURN VECTOR
1020  005470  000241                  RRLUP:  CLC                     ;CLEAR THE LINK
1021  005472  006000                          ROR     R0              ;SHIFT R0 RIGHT ONCE
1022  005474  005367  001732                  DEC     ROTOG           ;FINISHED?
1023  005500  001373                          BNE     RRLUP           ;NO
1024  005502  000207                          RTS     PC              ;YES- EXIT
1025  005504  017667  000000  001720  RTL:    MOV     @(SP),ROTOG     ;FETCH SHIFT COUNT
1026  005512  062716  000002                  ADD     #2,(SP)         ;STEP RETURN VECTOR
1027  005516  000241                  RLLUP:  CLC                     ;CLEAR LINK
1028  005520  006100                          ROL     R0              ;SHIFT R0 LEFT ONCE
1029  005522  005367  001704                  DEC     ROTOG           ;FINISHED?
1030  005526  001373                          BNE     RLLUP           ;NO
1031  005530  000207                          RTS     PC              ;YES- EXIT
1032
```

```
1033
1034  005532  032767  040000  172030  ERROR:  BIT     #B14,SR         ;TEST TTO DELETE SWITCH
1035  005540  001103                  BNE     ERXIT1          ;EXIT NOW IF TTO DELETE SWITCH IS UP
1036  005542  004567  001340          JSR     R5,SAVOS        ;SAVE AC0-5
1037  005546  012700  006663          MOV     #ERMS1,R0       ;MESSAGE POINTER TO R0
1038  005552  004767  001532          JSR     PC,TYPOUT       ;PRINT MESSAGE
1039  005556  016600  000014          MOV     14(SP),R0       ;FETCH SAVED PC
1040  005562  162700  000002          SUB     #2,R0           ;FIND ADDRESS OF ERROR CALL
1041  005566  010005                  MOV     R0,R5           ;PUT POINTER IN R5
1042  005570  004767  001352          JSR     PC,OCTPNT       ;PRINT PC
1043  005574  012700  007066          MOV     #STMS,R0        ;MESSAGE POINTER
1044  005600  004767  001504          JSR     PC,TYPOUT       ;PRINT "PS="
1045  005604  016600  000016          MOV     16(SP),R0       ;FETCH SAVED STATUS
1046  005610  004767  001332          JSR     PC,OCTPNT       ;AND PRINT IT
1047  005614  032715  000400          BIT     #B8,(R5)        ;TRAP?
1048  005620  001402                  BEQ     GOGO            ;NO
1049  005622  004767  176646          JSR     PC,SUBER        ;SUBROUTINE ERROR
1050  005626  032715  000020  GOGO:   BIT     #B4,(R5)        ;RPCS?
1051  005632  001402                  BEQ     .+6             ;NO
1052  005634  004767  000222          JSR     PC,CSTYPE       ;YES
1053  005640  032715  000010          BIT     #B3,(R5)        ;RPER?
1054  005644  001402                  BEQ     .+6             ;NO
1055  005646  004767  000254          JSR     PC,ERTYPE       ;YES
1056  005652  032715  000004          BIT     #B2,(R5)        ;RPDS?
1057  005656  001402                  BEQ     .+6             ;NO
1058  005660  004767  000264          JSR     PC,DSTYPE       ;YES
1059  005664  032715  000040          BIT     #B5,(R5)        ;RPDA & RPCA?
1060  005670  001402                  BEQ     .+6             ;NO
1061  005672  004767  000274          JSR     PC,ADTYPE       ;YES
1062  005676  032715  000100          BIT     #HD,(R5)        ;HEADER MESSAGE?
1063  005702  001402                  BEQ     .+6             ;NO
1064  005704  004767  000464          JSR     PC,HDTYPE       ;YES
1065  005710  032715  000001          BIT     #B0,(R5)        ;B0(1) FOR GOOD/BAD
1066  005714  001402                  BEQ     .+6             ;SKIP IF=0
1067  005716  004767  000076          JSR     PC,GBTYPE       ;GOOD/BAD
1068  005722  032715  000002          BIT     #B1,(R5)        ;B1(1) FOR DATA
1069  005726  001402                  BEQ     .+6             ;SKIP IF=0
1070  005730  004767  000150          JSR     PC,DATYPE       ;DATA
1071  005734  004567  001162  ERXIT:  JSR     R5,RESTOS       ;RESTORE AC0-5
1072  005740  012700  000015          MOV     #CR,R0          ;PRINT
1073  005744  004767  001226          JSR     PC,TTO          ;CR & LF
1074  005750  032767  100000  171612  ERXIT1: BIT     #B15,SR         ;SR15(1)=DELETE ERROR HALT
1075  005756  001001                  BNE     .+4             ;SKIP IF Z=0
1076  005760  000000          EHALT1: XX                      ;ERROR HALT. CONTINUE
1077  005762  000002                  RTI                     ;EXIT ERROR ROUTINE
1078
```

```
1079
1080
1081  005764  032767  020000  171576  LERCHK:  BIT     #B13,SR         ;SR13(1)=LOOP ON ERROR
1082  005772  001002                   BNE     .+6                     ;EXIT IF 1
1083  005774  062716  000004                   ADD     #4,(SP)         ;ADVANCE RETURN VECTOR OVER LOOP JUMP
1084  006000  000207                   LERXT:   RTS     PC              ;EXIT
1085
1086  006002  032767  010000  171560  LUPCHK:  BIT     #B12,SR         ;SR12(1)=LOOP ALWAYS
1087  006010  001002                   BNE     .+6                     ;EXIT IF 1
1088  006012  062716  000004                   ADD     #4,(SP)         ;ADVANCE RETURN VECTOR OVER LOOP JUMP
1089  006016  000207                   RTS     PC              ;EXIT
1090
1091  006020  012700  007050           GBTYPE:  MOV     #GDMS,R0        ;POINTER TO "GOOD"
1092  006024  004767  001260                   JSR     PC,TYPOUT       ;PRINT MESSAGE
1093  006030  016700  001316                   MOV     GOOD,R0         ;FETCH C(GOOD)
1094  006034  004767  000230                   JSR     PC,PNTOCT       ;PRINT OCTAL NUMBER
1095  006040  012700  007060                   MOV     #BDMS,R0        ;POINTER TO "BAD"
1096  006044  004767  001240                   JSR     PC,TYPOUT       ;PRINT MESSAGE
1097  006050  016700  001300                   MOV     BAD,R0          ;FETCH C(BAD)
1098  006054  004767  000210                   JSR     PC,PNTOCT       ;PRINT OCTAL NUMBER
1099  006060  000207                   RTS     PC              ;EXIT
1100
1101  006062  012700  006771           CSTYPE:  MOV     #CSMS,R0        ;POINTER TO "STATUS"
1102  006066  004767  001216                   JSR     PC,TYPOUT       ;PRINT TEXT
1103  006072  017700  001350                   MOV     @RPCS,R0        ;FETCH C(RPCS)
1104  006076  004767  000166                   JSR     PC,PNTOCT       ;PRINT OCTAL NUMBER
1105  006102  000207                   RTS     PC              ;EXIT
1106  006104  012700  007075           DATYPE:  MOV     #DAMS,R0        ;POINTER TO "DATA"
1107  006110  004767  001174                   JSR     PC,TYPOUT       ;PRINT TEST
1108  006114  016700  001236                   MOV     DATA,R0         ;FETCH C(DATA)
1109  006120  004767  000144                   JSR     PC,PNTOCT       ;PRINT OCTAL NUMBER
1110  006124  000207                   RTS     PC              ;EXIT
1111  006126  012700  007001           ERTYPE:  MOV     #ERMS,R0        ;PRINT
1112  006132  004767  001152                   JSR     PC,TYPOUT       ;"RPER="
1113  006136  017700  001300                   MOV     @RPER,R0        ;PRINT
1114  006142  004767  000122                   JSR     PC,PNTOCT       ;RPER
1115  006146  000207                   RTS     PC              ;EXIT
1116  006150  012700  007011           DSTYPE:  MOV     #DSMS,R0        ;PRINT
1117  006154  004767  001130                   JSR     PC,TYPOUT       ;"RPDS="
1118  006160  017700  001252                   MOV     @RPDS,R0        ;PRINT
1119  006164  004767  000100                   JSR     PC,PNTOCT       ;RPDS
1120  006170  000207                   RTS     PC              ;EXIT
1121  006172  012700  007021           ADTYPE:  MOV     #CYMS,R0        ;PRINT
1122  006176  004767  001106                   JSR     PC,TYPOUT       ;"CAR="
1123  006202  117700  001250                   MOVB    @RPCA,R0        ;PRINT
1124  006206                             ANDI    377,R0
1125  006212  004767  000730                   JSR     PC,OCTPNT       ;CAR
1126  006216  012700  007030                   MOV     #TAMS,R0        ;PRINT
1127  006222  004767  001062                   JSR     PC,TYPOUT       ;"TAR="
1128  006226  117700  001232                   MOVB    @RPDA1,R0       ;PRINT
1129  006232                             ANDI    37,R0
1130  006236  004767  000704                   JSR     PC,OCTPNT       ;TAR
1131  006242  012700  007040                   MOV     #SEMS,R0        ;PRINT
1132  006246  004767  001036                   JSR     PC,TYPOUT       ;"SAR="
1133  006252  117700  001204                   MOVB    @RPDA,R0        ;PRINT
1134  006256                             ANDI    17,R0
```

```
 1135  006262  004767  000660                        JSR     PC,OCTPNT       ;SAR
 1136  006266  000207                                RTS     PC              ;EXIT
 1137  006270  012767  000006  001072  PNTOCT:       MOV     #6,TOG4
 1138  006276  010067  001070          OLUP:         MOV     R0,WORK
 1139  006302                                        ANDI    7,WORK
 1140  006310  062767  000060  001054                ADD     #60,WORK
 1141  006316  016746  001050                        MOV     WORK,-(SP)
 1142  006322  006000                                ROR     R0
 1143  006324  006000                                ROR     R0
 1144  006326  006000                                ROR     R0
 1145  006330  005367  001034                        DEC     TOG4
 1146  006334  003360                                BGT     OLUP
 1147  006336  012767  000005  001024                MOV     #5,TOG4
 1148  006344  012600                                MOV     (SP)+,R0
 1149  006346                                        ANDI    61,R0
 1150  006352  004767  000620                        JSR     PC,TTO
 1151  006356  012600                    TOLUPO:     MOV     (SP)+,R0
 1152  006360  004767  000612                        JSR     PC,TTO
 1153  006364  005367  001000                        DEC     TOG4
 1154  006370  003372                                BGT     TOLUPO
 1155  006372  000207                                RTS     PC
 1156
 1157  006374                            HDTYPE:     PNTM    HDMS
 1158  006404                                        PNTM    GDMS
 1159  006414                                        PNTM    S2
 1160  006424                                        PNTOL   CYL
 1161  006434                                        PNTM    S1
 1162  006444                                        PNTOL   HED
 1163  006454                                        PNTM    S1
 1164  006464                                        PNTOL   SEC
 1165  006474                                        PNTM    CARET
 1166  006504                                        PNTM    S1
 1167  006514                                        PNTM    BDMS
 1168  006524                                        PNTM    S2
 1169  006534                                        PNTOL   CYLR
 1170  006544                                        PNTM    S1
 1171  006554                                        PNTOL   HEDR
 1172  006564                                        PNTM    S1
 1173  006574                                        PNTOL   SECR
 1174  006604                                        PNTM    CARET
 1175  006614  000207                                RTS     PC
 1176
```

```
1177
1178  006616  020046  020046  020040  HDMS:   .ASCII  /&      CYLINDER  TRACK SECTOR@/
1179  006624  041440  046131  047111
1180  006632  042504  020122  052040
1181  006640  040522  045503  051440
1182  006646  041505  047524  040122
1183
1184  006654  040040                  S1:     .ASCII  / @/
1185
1186  006656  020040     100          S2:     .ASCII  /  @/
1187
1188  006661     046     100          CARET:  .ASCII  /&@/
1189
1190
1191  006663     046  042446  051122  ERMS1:  .ASCII  /&&ERROR AT ADDRESS @/
1192  006670  051117  040440  020124
1193  006676  042101  051104  051505
1194  006704  020123     100
1195
1196
1197  006707     046  046117  035104  OLDMS:  .ASCII  /&OLD:     @/
1198  006714  020040  020040  040040
1199  006722  047046  053505  020072  NEWMS:  .ASCII  /&NEW:     @/
1200  006730  020040  020040     100
1201  006735     046  040503  046114  SUBRMS: .ASCII  /&CALLED FROM SUBROUTINE AT @/
1202  006742  042105  043040  047522
1203  006750  020115  052523  051102
1204  006756  052517  044524  042516
1205  006764  040440  020124     100
1206  006771     046  050122  051503  CSMS:   .ASCII  /&RPCS= @/
1207  006776  020075     100
1208
1209  007001     046  050122  051105  ERMS:   .ASCII  /&RPER= @/
1210  007006  020075     100
1211
1212  007011     046  050122  051504  DSMS:   .ASCII  /&RPDS= @/
1213  007016  020075     100
1214
1215  007021     046  040503  036522  CYMS:   .ASCII  /&CAR= @/
1216  007026  040040
1217
1218  007030  020040  040524  036522  TAMS:   .ASCII  /  TAR= @/
1219  007036  040040
1220
1221  007040  020040  040523  036522  SEMS:   .ASCII  /  SAR= @/
1222  007046  040040
1223
1224  007050  043446  047517  036504  GDMS:   .ASCII  /&GOOD= @/
1225  007056  040040
1226
1227  007060  040502  036504  040040  BDMS:   .ASCII  /BAD= @/
1228
1229  007066  020040  051520  020075  STMS:   .ASCII  /  PS= @/
1230  007074     100
1231
1232  007075     046  040504  040524  DAMS:   .ASCII  /&DATA= @/
```

```
  1233  007102  020075     100
  1234
```

```
1235
1236                007106                          .EVEN
1237
1238    007106  010446                  SAVO5:  MOV     R4,-(SP)        ;SAVE R0-R5 ON THE STACK
1239    007110  010346                          MOV     R3,-(SP)        ;R5 WAS STACKED BY THE JSR
1240    007112  010246                          MOV     R2,-(SP)        ;R4-R3 ARE STACKED ABOVE IT
1241    007114  010146                          MOV     R1,-(SP)        ;WITH R0 ON TOP
1242    007116  010046                          MOV     R0,-(SP)        ;R5 HOLDS THE RETURN PC, BUT AN
1243    007120  000115                          JMP     (R5)            ;RTS WOULD POP THE STACK-SO JUMP OUT
1244
1245    007122  005726                  RESTO5: TST     (SP)+           ;MOVE SP OVER WORD SAVED BY JSR
1246    007124  012600                          MOV     (SP)+,R0        ;R0-4
1247    007126  012601                          MOV     (SP)+,R1        ;ARE POPPED
1248    007130  012602                          MOV     (SP)+,R2        ;IN LIFO
1249    007132  012603                          MOV     (SP)+,R3        ;SEQUENCE
1250    007134  012604                          MOV     (SP)+,R4        ;R5 IS POPPED BY THE RTS AND
1251    007136  000205                          RTS     R5              ;THE PC IS TAKEN FROM R5
1252
1253    007140  012702  000012          DECPNT: MOV     #10.,R2         ;DIVISOR OF 10 FOR DECIMAL PRINT
1254    007144  000402                          BR      DECREM          ;PROCESS AND PRINT NUMBER
1255    007146  012702  000010          OCTPNT: MOV     #8.,R2          ;DIVISOR OF 8 FOR OCTAL PRINT
1256    007152  004767  000060          DECREM: JSR     PC,IDIVR        ;DIVIDE (R0) BY (R2) WITH REMAINDER IN R1
1257    007156  010146                          MOV     R1,-(SP)        ;STACK REMAINDER
1258    007160  005700                          TST     R0              ;HAS NUMBER DEFLATED BELOW RADIX?
1259    007162  001402                          BEQ     POPTT           ;YES - POP AND PRINT
1260    007164  004767  177762                  JSR     PC,DECREM       ;NO - DIVIDE NUMBER BY RADIX
1261    007170  012600                  POPTT:  MOV     (SP)+,R0        ;POP NUMBER FROM STACK
1262    007172  062700  000060                  ADD     #60,R0          ;MAKE ASCII
1263    007176  032767  040000  170364  TTO:    BIT     #B14,SR         ;IF SR14=1,DELETE TYPEOUT
1264    007204  001010                          BNE     TTOLF-2         ;EXIT
1265    007206  010067  170354                  MOV     R0,TPB          ;PRINT CONTENTS OF R0
1266    007212  105767  170346          TTOLP:  TSTB    TPS             ;DONE YET?
1267    007216  100375                          BPL     TTOLP           ;NO - KEEP LOOPING
1268    007220  022700  000015                  CMP     #CR,R0          ;WAS CHARACTER A CR!
1269    007224  001401                          BEQ     TTOLF           ;YES - PRINT LINE FEED
1270    007226  000207                          RTS     PC              ;RETURN TO POPTT OR MAIN PROGRAM
1271    007230  012700  000012          TTOLF:  MOV     #LF,R0          ;PRINT LF
1272    007234  000760                          BR      TTO             ;EXECUTE PRINT
1273
1274    007236  010067  000116          IDIVR:  MOV     R0,DIVID        ;SAVE DIVIDEND
1275    007242  005000                          CLR     R0              ;CLEAR QUOTIENT AREA
1276    007244  005001                          CLR     R1              ;CLEAR ACCUM.
1277    007246  060201                  DIVLP:  ADD     R2,R1           ;ADD DIVISOR TO ACCUM.
1278    007250  020167  000104                  CMP     R1,DIVID        ;COMPARE TO DIVIDEND
1279    007254  100002                          BPL     DVEND           ;WHEN ACCUM PASSES DIVIDEND - EXIT
1280    007256  005200                          INC     R0              ;INCREMENT QUOTIENT THEN
1281    007260  000772                          BR      DIVLP           ;ADD AGAIN
1282    007262  001003                  DVEND:  BNE     DIVN1           ;JUMP TO GET REMAINDER
1283    007264  005200                          INC     R0              ;NO REMAINDER - INCREMENT QUOTIENT
1284    007266  005001                          CLR     R1              ;REMAINDER OF 0
1285    007270  000207                          RTS     PC              ;EXIT
1286    007272  160167  000062          DIVN1:  SUB     R1,DIVID        ;FANCY FINAGLING TO
1287    007276  060267  000056                  ADD     R2,DIVID        ;DETERMINE THE REMAINDER
1288    007302  016701  000052                  MOV     DIVID,R1                ;REMAINDER TO R1
1289    007306  000207                          RTS     PC              ;EXIT WITH QUOTIENT IN R0
```

```
1290
1291  007310  010046                  TYPOUT: MOV     R0,-(SP)        ;STACK ADDRESS POINTER FOR MESSAGE
1292  007312  117600  000000          TPOFCH: MOVB    @(SP),R0        ;FETCH ASCII BYTE
1293  007316  022700  000100                  CMP     #100,R0         ;IS IT @(TERMINATOR)?
1294  007322  001411                          BEQ     TPOUTX          ;YES - EXIT
1295  007324  022700  000046                  CMP     #46,R0          ;IS IT CRLF FLAG?
1296  007330  001002                          BNE     .+6             ;NO
1297  007332  012700  000015                  MOV     #CR,R0          ;YES- CHANGE DATA TO CRLF
1298  007336  004767  177634                  JSR     PC,TTO          ;  PRINT
1299  007342  005216                          INC     (SP)            ;MOVE POINTER TO NEXT BYTE
1300  007344  000762                          BR      TPOFCH          ;FETCH NEXT CHARACTER
1301  007346  005726                  TPOUTX: POP                     ;POP STACK TO REACH RETURN VECTOR
1302  007350  000207                          RTS     PC              ;EXIT
1303
1304  007352  000000                  GOOD:   XX
1305  007354  000000                  BAD:    XX
1306  007356  000000                  DATA:   XX
1307  007360  000000                  DIVID:  XX
1308  007362  000000                  TOG1:   XX
1309  007364  000000                  TOG2:   XX
1310  007366  000000                  TOG3:   XX
1311  007370  000000                  TOG4:   XX
1312  007372  000000                  WORK:   XX
1313  007374  000000                  WORK1:  XX
1314  007376  000000                  UNIT:   XX
1315  007400  000000                  ATNB:   XX
1316  007402  000000                  CYL:    XX
1317  007404  000000                  HED:    XX
1318  007406  000000                  SEC:    XX
1319  007410  000000                  CYLR:   XX
1320  007412  000000                  HEDR:   XX
1321  007414  000000                  SECR:   XX
1322  007416  000000                  CYLA:   XX
1323  007420  000000                  HEDA:   XX
1324  007422  000000                  SECA:   XX
1325  007424  000000                  TTG:    XX
1326  007426  000000                  TEMP1:  XX
1327  007430  000000                  MASK:   XX
1328  007432  000000                  ROTOG:  XX
1329  007434  000000                  LERR:   XX
1330  007436  176710                  RPDS:   176710
1331  007440  176711                  RPDS1:  176711
1332  007442  176712                  RPER:   176712
1333  007444  176713                  RPER1:  176713
1334  007446  176714                  RPCS:   176714
1335  007450  176715                  RPCS1:  176715
1336  007452  176716                  RPWC:   176716
1337  007454  176720                  RPBA:   176720
1338  007456  176722                  RPCA:   176722
1339  007460  176723                  RPCA1:  176723
1340  007462  176724                  RPDA:   176724
1341  007464  176725                  RPDA1:  176725
1342  007466  176726                  RPM1:   176726
1343  007470  176727                  RPM11:  176727
1344  007472  176730                  RPM2:   176730
1345  007474  176731                  RPM21:  176731
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 1346  007476  176732                  RPM3:   176732
 1347  007500  176733                  RPM31:  176733
 1348  007502  176734                  RPB1:   176734
 1349  007504  176735                  RPB11:  176735
 1350  007506  176736                  RPB2:   176736
 1351  007510  176737                  RPB21:  176737
 1352  007512  176740                  RPB3:   176740
 1353  007514  176741                  RPB31:  176741
 1354  007516  000254                  RPIV:   .WORD   254
 1355  007520  000256                  RPSV:   .WORD   256
 1356  007522  000000                  DEBUG:  XX
 1357          007722                  INBUF=DEBUG+200
 1358          012222                  OUTBUF=INBUF+2300
 1359
 1360
 1361          000001                          .END                    ;THAT'S ALL FOLKS!
```

```
ADTYPE  006172          1061    1121#
ATNB    007400           540     789     830*    864    1315#
BAC     007354          1097    1305#
BDMS    007060          1095    1168    1227#
B0    = 000001           396#    414    1065
B1    = 000002           397#    415    1068
B10   = 002000           406#    860
B11   = 004000           407#    543     792    866
B12   = 010000           408#   1086
B13   = 020000           409#   1081
B14   = 040000           410#   1006    1014   1034   1263
B15   = 100000           411#    512     551    639    655    698    726    832   1009   1074
B2    = 000004           398#    416    1056
B3    = 000010           399#    417    1053
B4    = 000020           400#    418    1050
B5    = 000040           401#    419    1059
B6    = 000100           402#    420
B7    = 000200           403#    519     551    639    655    698    726
B8    = 000400           404#   1047
B9    = 001000           405#
CARET   006661          1166    1175    1188#
CC    = 177776           365#    386     490*   586*   672*
CHKAD   004346           562     661     736    878#
CLRS    003502           676     751#
CLRS1   003512           753#    755
CMER    004470           890     892     894    897#
CR    = 000015           373#   1072    1268   1297
CS    = 000020           418#    509     514    521    545    554    642    658    701    729    794    835    862
                         868     872    1008   1012   1016
CSMS    006771          1101    1206#
CSTYPE  006062          1052    1101#
CYL     007402           536*    537     574*   575    608*   627    689*   690    709*   710    716*   717    746*
                         747     889    1161   1316#
CYLA    007416           594*    635     650   1322#
CYLR    007410           880*    882*    883*   884*   889*  1170   1319#
CYMS    007021          1121    1215#
DA    = 000040           419#    509     545    554    642    658    701    729    794
DAMS    007075          1106    1232#
DATA    007356          1108    1306#
DATYPE  006104          1070    1106#
DD    = 000002           415#
DEBUG   007522           857*    858*   1356#  1357
DECPNT  007140          1253#
DECREM  007152          1254    1256#  1260
DIVID   007360          1274*   1278   1286*  1287*  1288   1307#
DIVLP   007246          1277#   1281
DIVN1   007272          1282    1286#
DS    = 000004           416#    509     514    545    554    642    658    701    729    794    935    862    868
                         872
DSMS    007011          1116    1212#
DSTYPE  006150          1058    1116#
DS1     004076           827*    829#
DVEND   007262          1279    1282#
EHALT1  005760          1076#
ER    = 000010           417#    509     514    521    545    554    642    658    701    729    794    835    862
                         868     872
```

```
ERM    = 104400            413#   794     835     862     868     872     897
ERMS     007001           1111   1209#
ERMS1    006663           1037   1191#
ERR    = 104000            412#   509     514     521     545     554     642     658     701     729     1008    1012    1016
ERROR    005532            480    482    1034#
ERTYPE   006126           1055   1111#
ERXIT    005734           1071#
ERXIT1   005750           1035   1074#
GB     = 000001            414#
GBTYPE   006020           1067   1091#
GDMS     007050           1091   1159    1224#
GOGO     005626           1048   1050#
GOOD     007352           1093   1304#
HD     = 000100            420#   897    1062
HDMS     006616            590   1158    1178#
HDTYPE   006374           1064   1157#
HED      007404            559*   569*    570     573*    612*    623     733*    742*    743     745*    891     1163    1317#
HEDA     007420            598*   636     651    1323#
HEDR     007412            879*   880     881*    888*    891    1172    1320#
HGL1     002270            631#   643
HGL2     002400            647#   659     662
HGO      002210            621#
HGO1     002364            641    644#
HGO2     002474            657    660#
HL1      002030            590#   593     597     600     602
HL2      002120            604#   607     611     614     616
HOME     004222            497    535     631     647     688    715     855#    863     869     873
HRDER    005412           1006#
HRN1     005424           1007   1009#   1015    1017
HSTRT    002000            585#   664
IDIVR    007236           1256   1274#
IL1      000614            492#
IL2      000676            503#   506
IL3      000710            505#   508
INBUF  = 007722            548    561     621*    622*    623*    624*    625*    626*    627*    628*    629*    630*    633
                           644*   645*    646*    649     660     722     734    1357#   1358
LERCHK   005764           1081#
LERR     007434           1329#
LERXT    006000           1084#
LF     = 000012            374#  1271
LUPCHK   006002           1086#
MASK     007430           1327#
MKBL1    003622            775#   779     785
MKBUF    003572            686    770#
NEWMS    006722            605   1199#
NOP    = 000240            387#
NSTR     003740            678    798#
NSWMES   005271            532    988#
NS2      000634            497#   510     517
N0       004765            798    949#
N1       004772            799    950#
N2       004777            800    951#
N3       005004            801    952#
N4       005011            802    953#
N5       005016            803    954#
N6       005023            804    955#
```

```
N7        005030            805     956#
N8        005035            806     957#
N9        005042            807     958#
OCTPNT    007146            902    1042    1046    1125    1130    1135    1255#
OLDMS     006707            591    1197#
OLUP      006276           1138#   1146
OUTBUF=   012222            695     704     771    1358#
PARIN     004150            592     596     606     610    841#
PC     =:000007             384#    492*    494*    497*    532*    535*    562*    588*    590*    591*    592*    596*    599*
.                           605     606*    610*    613*    631*    647*    661*    674*    676*    681*    682*    686*    688*
                            692*    715*    719*    736*    756*    757*    758*    769*    786*    795*    797*    819*    828*
                            834*    838*    840*    841*    843*    851*    853*    877*    896*    898*    900*    902*    903*
                            907*    910*    924*    927*    933*   1011*   1013*   1024*   1031*   1038*   1042*   1044*   1046*
                           1049*   1052*   1055*   1058*   1061*   1064*   1067*   1070*   1073*   1084*   1089*   1092*   1094*
                           1096*   1098*   1099*   1102*   1104*   1105*   1107*   1109*   1110*   1112*   1114*   1115*   1117*
                           1119*   1120*   1122*   1125*   1127*   1130*   1132*   1135*   1136*   1150*   1152*   1155*   1158*
                           1159*   1160*   1161*   1162*   1163*   1164*   1165*   1166*   1167*   1168*   1169*   1170*   1171*
                           1172*   1173*   1174*   1175*   1256*   1260*   1270*   1285*   1289*   1298*   1302*
PIOK1     000764            513     519#
PNTOCT    006270           1094    1098    1104    1109    1114    1119    1137#   1161    1163    1165    1170    1172    1174
POP    =  005726            421#    516     524    1301
POPPOP=   022626            422#
POPTT     007170           1259    1261#
PRX       004220            845     847     850     853#
PS     =  177776            386#    502*    530*    713*
P0     =  000000            388#
P1     =  000040            389#
P2     =  000100            390#
P2L1      001222            533#    546
P2L2      001246            537#    555     577
P2L3      001400            562#    567     572
P2N1      001364            553     559#
P3     =  000140            391#
P4     =  000200            392#    502
P5     =  000240            393#
P6     =  000300            394#
P7     =  000340            395#    490     499     530     586     672     713
RESTOS    007122            515     523    1071    1245#
RIN       004642            494     532     757     907    928#
RLLUP     005516           1027#   1030
ROTOG     007432           1018*   1022*   1025*   1029*   1328#
RPBA      007454            548*    633*    649*    695*    722*   1337#
RPB1      007502           1348#
RPB11     007504           1349#
RPB2      007506           1350#
RPB21     007510           1351#
RPB3      007512           1352#
RPB31     007514           1353#
RPCA      007456            537*    635*    650*    690*    717*   1123    1338#
RPCA1     007460           1339#
RPCS      007446            501*    512     519     533*    539*    549*    550*    551     634*    638*    639     653*    654*
                            655     696*    697*    698     724*    725*    726     788*    856*    874*   1006    1009    1014
                           1103    1334#
RPCS1     007450            534*    687*    714*    831*    876*   1335#
RPDA      007462            503     505     538*    637*    652*    691*    718*   1133    1340#
RPDA1     007464            636*    651*   1128    1341#
```

DZRPHA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
RPDS    007436          540    542*    543    787*    789    791*    792    832    855*    860    864    866    875*
                       1118   1330*
RPDS1   007440          870   1331*
RPER    007442         1113   1332*
RPER1   007444         1333*
RPI     000732          498    511*
RPIV    007516          498*  1354*
RPIX    000750          515*   522
RPM1    007466         1342*
RPM11   007470         1343*
RPM2    007472         1344*
RPM21   007474         1345*
RPM3    007476         1346*
RPM31   007500         1347*
RPSV    007520          499*  1355*
RPWC    007452          500*   547*    632*    648*    694*    721*   1336*
RRLUP   005470         1020*  1023
RTL     005504          828   1025*
RTR     005456         1018*
RC      =%000000        376*   494*    532*    590*    591*    601     603    605*    615     617    676*    690*    759*
                        760    762     764     766*    767     819*    821    823     824*    830    838*    844     900*
                        901*   908     911     913     918*    922     926*   931*    933*   1021*  1028*  1037*  1039*
                       1040*  1041    1043*   1045*   1072*   1091*   1093*  1095*   1097*   1101*  1103*  1106*  1108*
                       1111*  1113*   1116*   1118*   1121*   1123*   1125*  1126*   1128*   1130*  1131*  1133*  1135*
                       1138   1142*   1143*   1144*   1148*   1150*   1151*  1158*   1159*   1160*  1161*  1162*  1163*
                       1164*  1165*   1166*   1167*   1168*   1169*   1170*  1171*   1172*   1173*  1174*  1175*  1242
                       1246*  1258    1261*   1262*   1265    1268    1271*  1274    1275*   1280*  1283*  1291    1292*
                       1293   1295    1297*
R1      =%000001        377*   1241    1247*   1257    1276*   1277*   1278   1284*   1286    1288*
R2      =%000002        378*   1240    1248*   1253*   1255*   1277    1287
R3      =%000003        379*   1239    1249*
R4      =%000004        380*    503*    505     561*    660*    679*    734*   752*    753*    767*   772*    777     781*
                        878*    879     885    1238    1250*
R5      =%000005        381*    511*    515*    523*    591*    595*    605*   609*    678*    680    704*    705*    706*
                        731*    735     740*    751*    754*    771*    775*   776*    777*    846   1036*  1041*  1047
                       1050    1053    1056    1059    1062    1065    1068   1071*   1243    1251*
R6      =%000006        382*
R7      =%000007        383*
SAVDS   007106          511    1036    1238*
SCFLG   004010          764     766*    812*
SCSLT   003764          679     731     740     752     772     781     808*
SEC     007406          560*    564*    565     568*    617*    622     735*    893    1165    1318*
SECA    007422          603*    637     652    1324*
SECMES  004677          676     939*
SECR    007414          885*    887*    893    1174    1321*
SEKE    003670          692     719     787*
SEMS    007040         1131    1221*
SFCHK   003252          711     713*    720
SFCL1   003276          717*    730     748
SFCL2   003406          735*    739     744
SFCN1   003364          728     731*
SFSL1   003020          675*    683
SFSL2   003052          680*    685
SFSL3   003074          686*    693
SFSL4   003116          690*    702     712
SFSL5   003216          705*    708
```

DZRPHA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
SFSN1   003204            700    703#
SFSTRT  003000            671#   750
SFTER   005442           1014#
SIN     003522            682    757#
SIN1    003570            761    763    765    769#
SP    =%000006            375#   489*   517*   525*   585*   671*   768*   796*   852*   895*   900    925*   1018
                         1019*  1025   1026*  1039   1045   1083*  1088*  1141*  1148   1151   1238*  1239*  1240*
                         1241*  1242*  1245   1246   1247   1248   1249   1250   1257*  1261   1291*  1292   1299*
SPACE   004130            837#   839    851
SR    = 177570            364#  1034   1074   1081   1086   1263
START1  000600            489#   580    585    671
START2  001200            525    530#
START3  001476            576    579#
STMS    007066           1043   1229#
SUBER   004474            899#  1049
SUBRMS  006735            900   1201#
SWMES   005047            494    960#
S1      006654            838   1162   1164   1167   1171   1173   1184#
S2      006656           1160   1169   1186#
TAMS    007030           1126   1218#
TEMP1   007426           1326#
TKB   = 177562            367#   931
TKS   = 177560            366#   928*   929
TKV   = 000060            370#
TOG1    007362            504*   507*   677*   684*   703*   707*   732*   738*   741*   770*   784*   1308#
TOG2    007364            773*   778*   782*  1309#
TOG3    007366           1310#
TOG4    007370           1137*  1145*  1147*  1153*  1311#
TOLUPO  006356           1151#  1154
TPB   = 177566            369#  1265*
TPOFCH  007312           1292#  1300
TPOUTX  007346           1294   1301#
TPS   = 177564            368#  1266
TPV   = 000064            371#
TTG     007424            838*   848*   849    905*   915*   1325#
TTIL    004534            907#   923
TTIO    004522            599    613    819    841    905#
TTIX    004624            909    924#
TTO     007176            758    910    924   1073   1150   1152   1263#  1272   1298
TTOLF   007230           1264   1269   1271#
TTOLP   007212           1266#  1267
TTRX    004640            912    914    916    927#
TYPOUT  007310            494    532    590    591    605    676    681    819    838    900    1038   1044   1092
                         1096   1102   1107   1112   1117   1122   1127   1132   1158   1159   1160   1162   1164
                         1166   1167   1168   1169   1171   1173   1175   1291#
UMES    004666            819    937#
UNIQ    004022            492    588    674    818#   820    822
UNIT    007376            534    687    714    823*   825    827    831    876   1314#
UNS1    004100            826    830#   836
URDY1   000620            493#
WORK    007372            774*   776    783*  1138*  1140*  1141   1312#
WORK1   007374            594    598    608    612    846    906*   919*   920*   921*   922*   976   1313#
WWW     004242            858#   859
XX    = 000000            385#  1076   1304   1305   1306   1307   1308   1309   1310   1311   1312   1313   1314
                         1315   1316   1317   1318   1319   1320   1321   1322   1323   1324   1325   1326   1327
                         1328   1329   1356
```

DZRPHA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
.     = 007524          473#   478    479#   487#   520    528#   541    544    552    566    571    583#   640
                        656    669#   699    727    790    793    833    842    861    865    867    871    930
                       1010   1051   1054   1057   1060   1063   1066   1069   1075   1082   1087   1236#  1296
```

```
AND       428#
ANDI      424#   886   887   888   917   932  1124  1129  1134  1139  1149
LOOP      444#
PNTD      466#
PNTM      451#   493   531   589   590   604   675   818   837   899  1157  1158  1159  1161  1163
         1165  1166  1167  1168  1170  1172  1174
PNTO      461#
PNTOL     456#  1160  1162  1164  1169  1171  1173
ROTL      439#
ROTR      434#
```

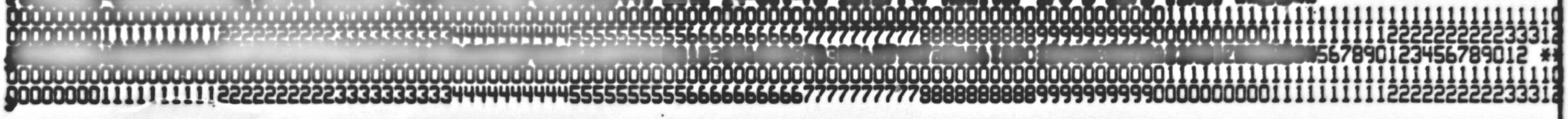
DZRPHA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
ADD      501   705   706   768   783   796   852   878   895   922   925  1019  1026  1083  1088
        1140  1262  1277  1287
BEQ      513   541   544   552   640   656   699   727   790   793   826   833   865   867   871
         909  1010  1015  1048  1051  1054  1057  1060  1063  1066  1069  1259  1269  1294
BGT     1146  1154
BHI      566   571   576   602   616   711   761   822   847   850   912
BIC      630   887   888   889   918   933  1125  1130  1135  1140  1150
BIS      549   634   653   696   724
BIT      512   519   540   543   551   639   655   698   726   789   792   832   860   864   866
        1006  1009  1014  1034  1047  1050  1053  1056  1059  1062  1065  1068  1074  1081  1086
        1263
BITB     870
BLOS     744   748   914
BMI      763   916
BNE      506   508   520   685   708   739   755   765   779   785   839   845   859   861   890
         892   894  1007  1023  1030  1035  1075  1082  1087  1264  1282  1296
BPL      552   641   657   700   728   930  1267  1279
BR       522   546   555   593   597   600   607   611   614   643   659   662   683   693   702
         712   720   730   820   836   842   863   869   873   923  1017  1254  1272  1281  1300
CLC      918  1020  1027
CLR      536   538   559   560   568   573   621   644   645   646   689   691   716   718   733
         745   774   775   906  1275  1276  1284
CLRB     542   753   787   791   855   875
CMP      505   565   570   575   601   615   710   743   747   760   821   844   846   849   889
         891   893   908   911   913  1268  1278  1293  1295
COMB     766
DEC      507   838   858   915  1022  1029  1145  1153
EMT      412
HALT     385   478
INC      564   569   574   684   707   709   738   742   746   754   778   784   848   928  1280
        1283  1299
JMP      510   567   572   577   580   664   750  1243
JSR      492   494   497   511   515   523   532   535   562   588   590   591   592   596   599
         605   606   610   613   631   647   661   674   676   681   682   686   688   692   715
         719   736   757   758   819   828   838   841   851   900   902   907   910   924  1036
        1038  1042  1044  1046  1049  1052  1055  1058  1061  1064  1067  1070  1071  1073  1092
        1094  1096  1098  1102  1104  1107  1109  1112  1114  1117  1119  1122  1125  1127  1130
        1132  1135  1150  1152  1158  1159  1160  1161  1162  1163  1164  1165  1166  1167  1168
        1169  1170  1171  1172  1173  1174  1175  1256  1260  1298
MOV      489   490   494   498   499   500   503   504   517   525   530   532   533   537   547
         548   561   585   586   590   591   594   595   598   603   605   608   609   612   617
         622   632   633   635   648   649   650   660   671   672   676   677   678   679   680
         690   694   695   703   704   713   717   721   722   731   732   734   735   740   741
         751   752   767   770   771   772   773   776   777   781   782   819   823   824   827
         830   838   857   879   880   885   900   905   926  1018  1025  1037  1039  1041  1043
        1045  1072  1091  1093  1095  1097  1101  1103  1106  1108  1111  1113  1116  1118  1121
        1126  1131  1137  1138  1141  1147  1148  1151  1158  1159  1160  1161  1162  1163  1164
        1165  1166  1167  1168  1169  1170  1171  1172  1173  1174  1175  1238  1239  1240  1241
        1242  1246  1247  1248  1249  1250  1253  1255  1257  1261  1265  1271  1274  1288  1291
        1297
MOVB     502   534   539   550   623   627   636   637   638   651   652   654   687   697   714
         725   788   831   856   874   876   931  1123  1128  1133  1292
NOP      563   579   663   737   749
RESET    491   587   673
ROL      624   625   626   882   883   919   920   921  1028
ROR      628   629   881  1021  1142  1143  1144
```

```
RTI       518     526    1077
RTS       756     769     786     795     797     834     840     843     853     877     896     898     903     927     933
         1011    1013    1024    1031    1084    1089    1099    1105    1110    1115    1120    1136    1155    1175    1251
         1270    1285    1289    1302
SUB       759     901    1040    1286
SWAB      884
TRAP      413
TST       762     825    1245    1258
TSTB      764     929    1266
.ABS      359
.ASCII    937     939     949     950     951     952     953     954     955     956     957     958     960     966     972
          980     988     996    1178    1184    1186    1188    1191    1197    1199    1201    1206    1209    1212    1215
         1218    1221    1224    1227    1229    1232
.BYTE     815
.END     1361
.EVEN    1004    1236
.MACR     424     428     434     439     444     451     456     461     466
.REM        1
.REPT     474     808     812
.WORD     480     481     482     483     811     829    1354    1355


 ERRORS DETECTED:  0
 DEFAULT GLOBALS GENERATED:  0

 *DZRPHA,DZRPHA.SEQ/SOL/CRF/DS:ERFZ/EN:ABS=DSKM:DZRPHA.P11
 RUN-TIME:  4  8  2 SECONDS
 RUN-TIME RATIO: 43/16=2.6
 CORE USED:  8K  (15 PAGES)
```

Spooler runtime 5 Seconds, 27 KCS, 134 disk reads, 3 disk writes, 46 pages

[redacted] Mon 14-Oct-75 16:27:47 Monitor XPC-B [1031] [redacted]